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TO BE TAKEN INTO FRONT LINE TRENCHES

# USE OF MINES IN TRENCH WARFARE

(From the French School of St. Cyr)

TRANSLATED AND EDITED AT THE  
ARMY WAR COLLEGE

*Explosive*

JULY, 1917



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WAR DEPARTMENT,  
WASHINGTON, *July 23, 1917.*

The following notes on Use of Mines in Trench Warfare are published for the information of all concerned.

[062.1, A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

TASKER H. BLISS,  
*Major General, Acting Chief of Staff.*

OFFICIAL:

H. P. MCCAIN,  
*The Adjutant General.*

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WAR DEPARTMENT,  
THE ADJUTANT GENERAL'S OFFICE,  
*Washington, June 19, 1917.*

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BY ORDER OF THE SECRETARY OF WAR:

H. P. MCCAIN,  
*The Adjutant General.*

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# USE OF MINES IN TRENCH WARFARE.

[From the French St. Cyr School.]

(Secret and Confidential. For Official Use Only. Not to be Taken into First-Line Trenches.)

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## USE OF MINES.

In sectors where the distance between the two lines is below 150 meters, mine warfare must be used. When the trenches are farther apart, underground warfare is seldom employed. In special cases, however, when there are strong ventilators and the line is stable enough to permit of it, advance may be made underground.

### SPECIALLY MENACED POINTS.

The most vulnerable points evidently are the following: The outposts in advance of the line, machine-gun positions approximately located by the enemy, and the junction points of the communicating trenches with the first line.

### SURFACE OBSERVATION.

Underground activity, either offensive or defensive, is first observed from those points in our lines nearest to it. All enemy trenches facing a salient of our lines will be the object of particular attention and closest daily observation. This observation of the first-line trenches should disclose the presence of enemy underground works and their approximate location.

One of the difficult questions in mining is the removal of the earth. Expert miners sometimes remove the earth as far as 100 to 200 meters from the entrance to the gallery. They throw it on old ruined shelters, in shell holes, on the reverse of the trenches. But these precautions are not always rigidly observed. When the noncommissioned officer is absent, or the enemy bombards a little strongly, some one in the working party not wanting to work overtime throws several clods of earth on the parapet.

## INDICATIONS REVEALING THE ENEMY GALLERIES.

Freshly placed earth coming from underground is white and less dull in color than that of the parapets, which have been washed by the rain and blackened by explosives. The difference in color for the first day or so is striking. In chalk, large white spots are seen on the reverse of the German trench, daily growing larger. Without doubt they are working near by, and should be watched.

A communication trench comes out at a salient, and runs back from 150 to 200 meters. Patches of chalk, freshly moved and increasing daily, are observed. These are indications of underground work starting from the salient.

Four or five meters of enemy trench without loopholes, but with loopholes close together to the left and right, may mark a gallery entrance.

A miner's working relief reaches the gallery, each man carrying a piece of the frame or a lining plank over his shoulder, the ends of which can be seen over the parapet or through the loopholes. These are indications of a gallery position, especially if the men all move in the same direction and are lost to view at the same place.

From a raised point on the second or third line we see, with field glasses, an abnormal accumulation of sandbags in a well-known area. These sacks may indicate an underground gallery.

Patrols sent out in front of the enemy trenches sometimes bring back valuable information. They may hear the rumble of ventilators, the noise of a truck moving on the rails, men working near a gallery entrance, etc.

The enemy fire with heavy calibers on portions of the first line. Often the same corner is bombarded. This may indicate that the enemy artillery is seeking to facilitate the miner's work by overthrowing the entrances to troublesome galleries in the trench attacked.

*Listening for underground noise.*—The observation of hostile trenches may give indications which will limit the zone necessary to be watched; but for accurate results we must listen for underground noises.

*Positions of listening posts.*—The listening post is placed at the head of a gallery, in an angle of a gallery, in a deep dug-out, in a niche under the parapet, or on the bottom of the

trench. The points nearest to the enemy trench are selected for the listening posts. Below the outposts there is always a niche, allowing a man to place his ear to the ground (hence the name listening posts).

*Hours and precautions.*—The most favorable hours are morning about 4 or 5 o'clock, at 2 p. m., and at midnight. All the occupants of that part of the trench must keep still, and all work in the trench and the mine must cease for a given time.

*What is heard.*—The inexperienced ear hears too many things, and is easily mistaken in the noises heard. A relief passing in the enemy trench or in his own trench at 40 meters sounds strangely like the noise of a pick. A man hitting a ground sill or striking it with his heel gives the idea that work is being done. The impact of bullets on the parapet at night, when a fusillade is uninterrupted, also gives the idea of underground work. A man filing a fuse at the foot of his loophole suggests the presence of an enemy revolving borer. A man who snores beside the gallery entrance imitates the noise of a ventilator and may be mistaken for it.

However, to even a partially trained ear the noise of the pickax is characteristic. It is not a harsh sound, like that of a heel striking on chalk ground, nor is it like the shock of bullets piercing the parapet. It is a low, rhythmic sound, with regular cadence. In a gallery the miner works kneeling. When he has struck five or six blows with the pickax, he takes a breath. He repeats this process about 12 times. He stops two or three minutes, and the second miner clears away the earth and fills the truck with sacks. The first miner resumes his work. It is easy to distinguish this regular cadence peculiar to the miner.

In an infantry company there are always several miners by occupation, or several men familiar with engineering. These men are selected specially for the listening service. They can give accurate information to the officers and noncommissioned officers of a sapper company. It is also a good thing for a platoon commander to descend into a gallery and train his ear by exchanging pickax signals with the miner in the adjoining gallery.

*Distance at which noise can be heard.*—The following indications help in determining the distance of underground work:

Four men work in a gallery. They start the work, then stop. The ear is placed against the side of the wall, the other



ear being covered by the hand. If the work is heard under these conditions, it is at a distance of 25 to 30 meters.

If all noise is avoided, and the work is heard without placing the ear against the wall, the distance is 12 to 15 meters.

If there is talking or working going on, and still the underground work is heard in spite of it, the distance is 8 to 10 meters.

At six meters a man can hear all the sounds of the pickax, the chalk crumbling, the pieces rolling down on one another, the sliding and stacking of cases. These noises sound as if they were immediately below.

At four meters a man can hear talking, the scraping of buttons against the wall, the miner turning around.

The humming of a ventilator can be heard at 40 meters without taking precautions to hear it.

An automatic borer can be heard all through the sector.

*Directions from which noise comes.*—It is easier to determine the direction of noise than the distance. There is always a chance of making observations in the galleries—one on the right, the other on the left of the noise. The exact location of the enemy underground work can be determined by intersections.

The engineer companies have an apparatus for intensifying the sound (strong microphones). They reinforce the sound when the apparatus is in the direction of the source of the sound. Their greatest defect is that they magnify sound too much and too many things are heard. Why hear for a distance of 100 meters when the enemy trench is only 40 meters away? Everything is heard in a mine gallery. It is difficult to distinguish among the many noises that of the enemy miner's pick. The ear is amply sufficient.

The beginner has a tendency to exaggerate the proximity of sounds. He thinks he is close to the enemy when he is still at a distance, and he takes steps to catch the enemy by exploding a camouflet, whose only effect is to retard his own work.

#### USEFUL INFORMATION ON MINES.

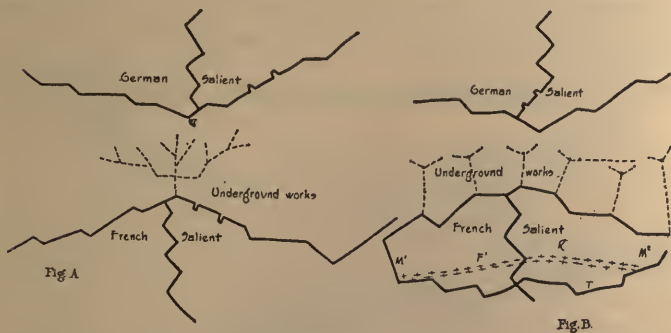
*Defensive system.*—Two arrangements can be adopted: Fan-shaped arrangement (fig. a) or arrangement of independent parallel galleries (fig. b). The second arrangement is preferable.

*Interval between galleries.*—Arrangement 2 being adopted, calculate the interval between two neighboring galleries in such



manner as to prevent the enemy working underground. At the head of each gallery two elbows of 6 meters, with boring chambers, are made. A 6-meter boring is made from each chamber. At the bottom of the boring a camouflet is placed, effective for radius of 6 meters (not more heavily charged or the gallery will be demolished). The camouflet of the neighboring gallery forms a tangent to the first. The interval between the two galleries can not, therefore, be greater than 36 meters. In practice we would take 30 meters.

*Start, depth, and progress of work.*—Start from first line. Start at 4 meters, with a slope of 20 per cent to 30 per cent down to a depth of 10 meters. Then horizontal. Length to gallery and return without ventilation can cover 30 meters.



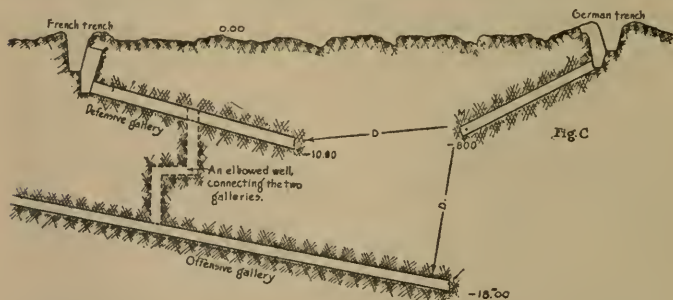
*Barrage trench for miners.*—If the enemy passes in spite of everything, the explosion should at least have been foreseen. The enemy's attack must be limited or stopped, and this is always possible after the explosion of the charge, which may explode well in advance of our lines and act only as a strong means of launching his attack. The barrage trench is established at from 40 to 50 meters in rear of the salient T (fig. 2). In front of the parapet T, wire entanglement R, and two machine-gun positions M and M<sup>2</sup> are placed. When the enemy's explosion is near, only a few men are left to occupy the salient. The German explosion does not bury anyone, and when the attack is launched it breaks down at the entanglement R.

*Camouflet.*—The sector commander is warned when the defense is about to explode a camouflet. About 10 meters on each side of the gallery are evacuated as a precaution. The only danger

is in having several sandbags fall on the sides of the gallery entrance. Warn the working party charged with the relief, in order that they may not block the passage of men in the first line. Do not fire or make any changes in that part of the trench, in order that the enemy may not locate the position. Do not fire rockets before a given time. The camouflet sometimes shakes the ground and dust is visible. Nine times out of ten the camouflet is used at night.

When the enemy explodes a camouflet, fire a quantity of rockets to locate the positions. Fire grenades and throw bombs at the presumable position of the gallery. Send several men in front of the parapet to listen to what is going on in the enemy trench.

*Offensive galleries.*—These are intended to pass under the adversary's defenses. Depth.—Start at first line when it is far



enough away from the enemy. Start at second line, or at special communication trench about 20 meters in the rear of the first line, when the enemy trench is too near. (See preceding.) A depth of 15 to 18 meters should be attained. The work is done as in ordinary galleries.

*Superimposed galleries.*—This procedure gives splendid results in deceiving the enemy, who thinks he is protecting himself. The defensive gallery starts at the first line and the offensive gallery starts in rear of it. Both galleries are on the same vertical plane, the second being more advanced in the direction of the enemy than the first. An enemy listener easily confuses one with the other, and the offensive gallery passes under him. (See figure.) Distances  $D$  and  $D^1$  are the same. The miner,  $M$ , confuses the two sounds, and the offensive gallery passes under him.

*Mine chambers.*—They are of special interest to the Engineer Corps from a technical point of view. The best hours for exploding them are 4 a. m. and 7 p. m. When an attack is launched at a great distance, or when there is to be no attack, the explosion is preceded by several minutes of noise in the trenches. We commence firing and show several bayonets over the parapet. The enemy believes an attack is coming, comes out of his shelter, and mans his trenches. After the explosion we fire on the mine crater for four hours with artillery, grenades, and bombs. This fire should cover all the area exploded by the mine chamber and should prevent any help to the wounded or buried.

*Launching an attack by means of mining.*—The mine is an irresistible means of launching an attack. In a mined sector the best troops completely lose their bearings for several seconds after an explosion. These several seconds prevent the machine gun from firing, and the assailant gains a foothold in the first line and often in the second.

A mine attack should be prepared in the following manner:

Several days beforehand the attacking troops are sent to the rest camp. The plan of the jumping-off trenches, the trenches to be attacked, the ground trace of the crater, and the zone of the searchlights are drawn on the ground with chalk. Each attacking fraction is placed in position, with the matériel to be carried. Each fraction's line of advance is marked out in chalk, as well as the section of the enemy's trench to be occupied and the position of the barrage. Every detail is studied thoroughly, and the exercise repeated a dozen times. The attack is then carried out as planned.

*Craters.*—The question of the occupation of craters must be decided by an authority higher than the platoon commander. In certain cases it is well to occupy them; in others, inadvisable. We will discuss only the practical work to be done in each case.

*Craters to be occupied.*—Crown the rim on the enemy side with a continuous trench, joined to the lines by (at least) two communicating trenches. Run out galleries in three directions, first for protection and later for use in the attack. Construct bombproofs on the half cone on the enemy side.

A crater is a position advantageous for the construction of auxiliary defenses, for the removal of earth from the galleries, for massing troops for an attack, and for flanking the lines.

*Craters that the enemy occupies.*—They should be hampered with bombs and grenades. We should head off the enemy by means of two well-placed mine chambers, which are always possible to fire rapidly when the scheme of defense is by independent galleries.

*Craters not occupied.*—It is well to see what goes on at the bottom. An outpost of several men or a sentinel may be posted for this purpose in a communicating trench on the friendly rim. Two communicating trenches may also be used to crown the friendly rim with a trench with slight counterslope. The outposts place a dozen loopholes permitting fire on the bottom. We may also fill up the bottom with chevaux de frise and other auxiliary obstacles that can be thrown in. If the craters are in the way, we can always turn them by mining. (See figures for different examples:)

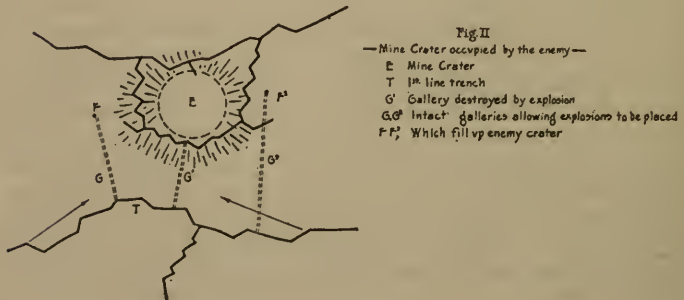




Fig. III  
 — Mine crater not to be occupied —  
 t Jumping off trench  
 T Trench crowning friendly rim  
 L.L.L. Loopholes overlooking the bottom and enemy rim  
 M.M' Flanking automatic rifle  
 R Wire entanglement

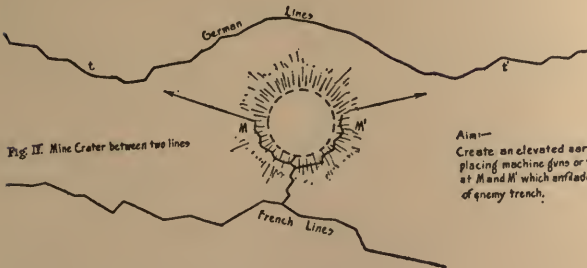
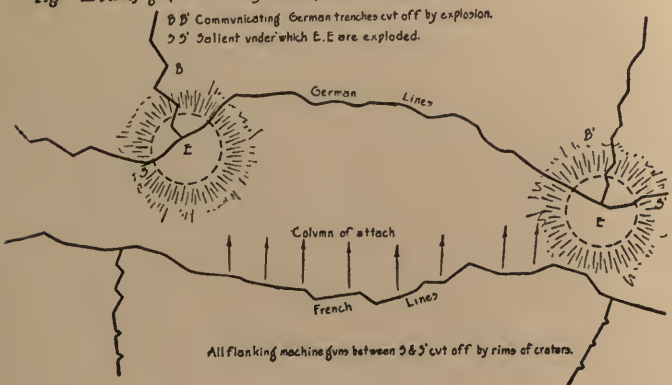


Fig. II. Mine Crater between two lines

Aim—  
 Create an elevated earth position for  
 placing machine guns or throwing bombs  
 at M and M' which enfilade the portion t & t'  
 of enemy trench.

Fig. V. Mine Crater for flanking purposes, see Fig. I & III.

Fig. VI. Destroying a portion of enemy trench by means of two mine craters.







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